

AMENDMENTS TO THE SPECIFICATION

After paragraph [0016], insert paragraph [0016.5] as follows:

[0016.5] Fig. 6 is a view similar to Fig. 1, except showing two simplified hydraulic circuits

Amend paragraph [0022] as follows:

[0022] A fluid conduit 30 is connected to the conduit 20 between the wheel brake 28 and the apply valve 24, and provides a return path for hydraulic brake fluid from the wheel brake 28 to the reservoir 14. A normally open release valve 32 is disposed in the fluid conduit 30, and is operated by a solenoid 34, to control the flow of hydraulic brake fluid through the fluid conduit 30. The release valve 32 is preferably implemented as a normally open poppet valve operated by the solenoid 34 in response to an electrical command signal, but may be any suitable valve, such as a spool valve, responsive to a command signal (electrical, pneumatic, or other suitable command signal). This flow path through the release valve 30 32 defines the release path of the hydraulic brake circuit 12 of the EHB system 10.

Amend paragraph [0027] as follows:

[0027] According to one exemplary control scheme that may be used in the EHB system 10, when a brake apply signal is initially generated by the driver or automatically, the controller 36 determines that the wheel brake pressure P_b at the wheel brake 28 is less than the demanded brake pressure P_d , calculates an estimated amount of brake fluid $[[Q]]$ which has to be added to the wheel brake 28 to raise the wheel brake pressure P_b at the wheel brake 28 to equal the demanded brake pressure P_d , and determines a desired rate of brake fluid flow R_Q into the wheel brake 28 to bring the wheel brake pressure P_b to equal the demanded brake pressure P_d with a desired rate of change in the wheel brake pressure P_b (rate of response). The desired rate of change in the wheel brake pressure P_b will be dependent upon various factors

but in general, the greater the difference between the demanded brake pressure P_d and the wheel brake pressure P_b , the greater the desired rate of change in the wheel brake pressure P_b . The wheel brake pressure P_b may be either directly measured by a pressure sensor (not shown) at the wheel brake 28 or inferred from other parameters (such as vehicle speed, wheel speed, supply pressure P_s , etc.). The controller 36 shuts the release valve 32 by energizing the solenoid 34 and opens the apply valve 24 an amount that is calculated to achieve the desired rate of brake fluid flow R_Q given the difference between the supply pressure P_s and the wheel brake pressure P_b . As pressurized brake fluid flows out of the HPA 22, through the apply valve 24 and into the wheel brake 28, the HPA pressure P_{HPA} drops, and the controller 36 will energize the motor 18 to run the pump 16 as necessary to restore pressure in the HPA 22. The controller 36 continuously adjusts the signal to the apply valve solenoid 34 as the wheel brake pressure P_b approaches the demanded brake pressure P_d , to account for changes in the wheel brake pressure P_b , any changes in the supply pressure P_s , and so that the apply valve 24 closes (the solenoid 34 is deenergized) when the wheel brake pressure P_b equals the demanded brake pressure P_d . The apply valve 24 and the release valve 32 generally remain shut to hold the wheel brake pressure P_b constant as long as the wheel brake pressure P_b is equal to the demanded brake pressure P_d (except to implement the feature of the over-pressure relief strategy of the invention, as will be described below).

Amend paragraph [0028] as follows:

[0028] When the brake apply signal generated by the driver or automatically is reduced, for example, by the driver reducing pressure on the brake pedal, the controller 36 determines that the wheel brake pressure P_b at the wheel brake 28 is greater than the demanded brake pressure P_d , calculates an estimated amount of brake fluid $[[Q]]$ which has to be removed to the wheel brake 28 to lower the wheel brake pressure P_b at the wheel brake 28 to equal the now lower demanded brake pressure P_d ,

and determines a desired rate of brake fluid flow R_Q out of the wheel brake 28 to bring the wheel brake pressure P_b to equal the demanded brake pressure P_d with a desired rate of change in wheel brake pressure P_b . The controller 36 leaves the apply valve 24 shut (by leaving the solenoid 26 deenergized) and opens the release valve 32 by decreasing the energizing signal to the solenoid 34 an amount that is calculated to achieve the desired rate of brake fluid flow R_Q given the difference between the wheel brake pressure P_b and the pressure in the reservoir 14. The reservoir 14 is vented to atmosphere, and is sufficiently large to receive all the fluid from the wheel brake 28 without pressurizing, so the pressure in the reservoir 14 will remain zero (atmospheric pressure) at all times. Therefore, the controller 36 does not actually perform a comparison of wheel brake pressure P_b and reservoir pressure, but rather bases the control signals to the components of the EHB system 10 based on the wheel brake pressure P_b ($P_b - 0 = P_b$) when relieving pressure to the reservoir 14. The controller 36 continuously adjusts the signal to the apply valve solenoid 34 as the wheel brake pressure P_b approaches the demanded brake pressure P_d , to account for changes in the wheel brake pressure P_b and so that the release valve 32 closes when the wheel brake pressure P_b equals the demanded brake pressure P_d .

Amend paragraph [0032] as follows:

[0032] An electronic pressure relief strategy according to the present invention preferably includes measuring, sensing or estimating the pressure, P_{HPA} , in the HPA 22, (directly or indirectly using any suitable sensing mechanism) and using the controller 36 to compare the HPA pressure to a predetermined safety pressure set-point, P_{set} . In embodiments of the EHB system 10 in which the HPA isolation valve 23 is provided, if the P_{HPA} pressure is equal to or higher than the P_{set} pressure (i.e., if the sensed accumulator pressure P_{HPA} at least equals the preset pressure P_{set}), the controller 36 operates to open the HPA isolation valve 23. If the pump 16 is operating, the controller 36 acts to stop the motor 18, to prevent pressure from rising

further. If no braking signal is present, the release valve 32 is open, but the apply valve 24 is closed, preventing the pressure in the HPA 22 from being vented to the reservoir 14. Therefore, the controller 36 causes the apply valve 24 to be opened, establishing a pressure relief path from the accumulator 22 through the apply path and the release path of the EHB system 10. Preferably, the controller 36 will only partially open at least one of the HPA isolation valve 23 and the apply valve 24 to provide a controlled flow of fluid from the HPA 22 to prevent depressurizing the HPA 22 more than desired. When the pressure in the HPA 22 is reduced back down below the set-point pressure P_{set} , the controller 36 shuts the HPA isolation valve 23 and the apply valve 24. Preferably, the controller 36 will not shut the HPA isolation valve 23 and the apply valve 24 until the pressure in the HPA 22 has decreased some predetermined margin below the set-point pressure P_{set} to prevent rapid repeated cycling of these valves, much like a mechanical pressure relief valve (safety valve) will normally provide some blow-down below the opening set-point pressure thereof.

Amend paragraph [0034] as follows:

[0034] Next, referring to Fig. 2, consider a case where a braking signal is present. If the wheel brake pressure P_b is equal the demanded brake pressure P_d , then the brake fluid flow rate R_Q is equal to zero, that is, no brake fluid should flow into or out of the wheel brake 28. The apply path through the apply valve 24 and the release path through the release valve 32 are both closed to hold the desired amount of brake fluid in the wheel brake 28. If pressure in excess of P_{set} is determined to exist in the HPA 22, the HPA isolation valve 23 is opened to connect the HPA 22 to the conduit 20. In order to relieve the excessive pressure in the conduit 20, the apply valve 24 is opened to permit an appropriate pressure relieving flow rate of brake fluid, F_l to reduce the supply pressure P_s in the conduit 20 to below the set-point pressure P_{set} . Suitably the magnitude of the pressure relieving flow rate F_l will increase dependent upon the degree to which the HPA pressure P_{HPA} , and thus the supply pressure P_s , exceeds the

set-point pressure P_{set} . Simultaneously, the release valve 32 is opened sufficiently to pass the same flow rate F_l of brake fluid through the release path that is flowing through the apply path. Since the flow rate through the release path is the same as through the apply path, the amount of brake fluid $[[Q]]$ in the wheel brake 28 remains constant, and therefore the pressure P_b at the wheel brake 28 will remain constant at the demanded brake pressure P_d .

After paragraph [0043], insert paragraph [0043.5] as follows:

[0045.5] As an example, Fig. 6 is another view of the brake system 10 of Fig. 1. As indicated above, EHB systems for motor vehicles are more complex than the simplified EHB system 10 illustrated in Fig. 1. For example, as illustrated in Fig. 6, the brake system 10 can have a second branch. The components of the second branch are similar to those of the first branch, and similar components, with similar functions, are similarly numbered, except that a "prime" (') mark is added. Particularly, at least one pair of valves (an apply valve 24' and a release valve 32') may be provided in the second branch to supply a wheel brake 28' through a conduit 20'. In such an arrangement, the controller 36 could control the solenoids 26' and 36' to control the valves 24' and 32', respectively, for the wheel brake 28' separately. If it is necessary to increase the amount of flow from the HPA 22 in order to alleviate HPA pressure, the controller 36 can output a voltage signal to more than both the apply valve 24 and the apply valve 24' to further increase the flow from the HPA 22 through the apply valves 24 and 24', and through the associated release valves 32 and 32'.